

# Indications for Vena Caval Fenestration

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*A retrospective study of 20 patients who underwent vena caval fenestration showed that in 50% of the patients the procedure was done for prophylaxis and in 50% it was done for therapeutic reasons. After this procedure five patients had persistent leg swelling, two had deep venous thrombosis, two had pulmonary emboli and one died of a respiratory arrest. We recommend limiting the use of vena caval fenestration to those patients who have verified pulmonary embolism while adequately anticoagulated or patients who have pulmonary embolism and a major contraindication to anticoagulation.*

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Anticoagulation is widely accepted as the standard therapy for established venous thromboembolism. An alternative therapy is vena caval fenestration but the indications for the use of this procedure are not as clear. There is a broad range of indications for this procedure. The extremes range from prophylaxis for patients undergoing an abdominal operation to treatment of patients in whom anticoagulation has failed or who have contraindications to anticoagulation.<sup>1,2</sup> Before making recommendations regarding the indications for vena caval fenestration, the benefits and risks of the procedure must be assessed in the context of whether the aim is prophylaxis or therapy for established disease, and also must be compared with other modalities in these settings. This report describes the findings of a retrospective study of 20 patients who underwent vena caval fenestration.

### Patients and Methods

The charts of 20 patients who underwent vena caval fenestration from 1977 to 1982 were reviewed. Cases were selected by reviewing the angiography records of the Stanford Radiology Department from 1977 through 1982 and by reviewing cases classified as vena caval fenestration by Stanford University Hospital's record department, where the retrieval system can recover cases only from 1979 through 1981. There were 13 men and 7 women ranging in age from 24 to 79 years, with a median age of 61 years. Greenfield filters were placed in 11 cases, Mobin-Uddin umbrellas were used

in 5 cases, prosthetic clips were applied in 4 cases and suture plication was used in 1 case. In reviewing the indications for vena caval fenestration and the subsequent outcome of complications, cases were classified as deep venous thrombosis if there were positive findings on a venogram and pulmonary embolism if results of a pulmonary angiogram were positive. Cases in which these diagnoses were made without objective supporting studies were classified as suspected deep venous thrombosis or pulmonary embolism, respectively.

### Results

Table 1 shows both the indications for vena caval fenestration and subsequent outcome, including complications. As shown in Table 1, 10 of the 20 patients had prophylactic vena caval fenestration and in the remaining 10 the interruption was intended as a therapeutic maneuver. Both groups of patients had complications. The frequency of persistent leg swelling may be underestimated because only 12 patients were available for long-term follow-up. The respiratory arrest was fatal and occurred within 90 minutes of Mobin-Uddin umbrella placement. The hemorrhage occurred after laparotomy for prosthetic clip placement and required surgical correction. The patient was not anticoagulated at the time. The two devices that migrated were Mobin-Uddin umbrellas. The first lodged in the right renal vein without further sequelae. The second lodged in the right iliac vein, resulting in acute phlegmasia cerulea dolens with arterial spasm. This patient underwent

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# VENA CAVAL FENESTRATION

TABLE 1.—Retrospective Study of 20 Patients Undergoing Vena Caval Fenestration at Stanford University School of Medicine

Indications	Number of Patients	Outcome and Complications*	Number of Patients
<i>Prophylactic</i>			
Suspected DVT or PE . . . . .	5	Leg swelling . . . . .	2
PE or DVT . . . . .	4	Further anticoagulation . . . . .	1
Recurrent PE . . . . .	1	DVT . . . . .	2
		Pulmonary embolism . . . . .	1
		Respiratory arrest . . . . .	1
<i>Therapeutic</i>			
Recurrent PE on anticoagulation . . . . .	2	Leg swelling . . . . .	3
PE with contraindication to anticoagulation . . . . .	6	Migration of device . . . . .	2
DVT with contraindication to anticoagulation . . . . .	1	Further anticoagulation . . . . .	2
Massive pulmonary embolism . . . . .	1	Pulmonary embolism . . . . .	1
		Hemorrhage . . . . .	1
DVT=deep venous thrombosis; PE=pulmonary embolism			
*Only 12 patients were available for long-term follow-up.			

surgical thrombectomy with removal of the Mobin-Uddin umbrella.

## Discussion

Our patients had caval fenestration for the wide variety of reasons reflected in the literature. The extremes range from prophylaxis against pulmonary embolism in patients requiring an abdominal operation to the suggestion that use be restricted to patients who have recurrent pulmonary embolism while being optimally anticoagulated. In addition to problems with the indications for caval interruption we were concerned because in a number of patients diagnosis and management were based solely on clinical findings despite a disappointing accuracy of only 50% for either pulmonary embolism or deep venous thromboembolism.<sup>3,4</sup>

In our group of patients persistent leg swelling and deep venous thrombosis occurred in 33% and 14%, respectively, and these values are close to the reported ranges of 18% to 50% for leg swelling and 9% to 13% for deep venous thrombosis.<sup>2,5,6</sup> Whereas rates of 0% to 5%<sup>5,6</sup> for pulmonary embolism post fenestration have been reported, 2 of our 20 patients had angiographically recorded pulmonary embolism. There were two further complications that warrant mention. Unfortunately, because an autopsy was not done on the

patient who had the respiratory arrest, the cause of arrest cannot be determined. The migration of the two umbrellas is also troublesome. Migration to renal and iliac veins has been reported previously, but in no case was there development of acute phlegmasia cerulea dolens with arterial spasm.<sup>1,7</sup>

## Recommendations

On the basis of our retrospective review and examination of the literature, we can offer several suggestions. Because of the complications and invasive nature of vena caval fenestration, it is questionable whether it is an appropriate form of prophylaxis. It is not designed to reduce the frequency of venous thrombosis. Before its use can be justified for routine prophylaxis against pulmonary embolism in a surgical patient, a controlled trial comparing it with other methods such as administering low doses of heparin, dextran or the use of calf massaging pumps is needed.

Vena caval fenestration should be seriously considered in patients who have proved pulmonary embolism while receiving therapeutic doses of anticoagulation. It also has a role in patients with pulmonary embolism who have contraindications to anticoagulation. But these contraindications must be evaluated in context. Firm contraindications include a recent neurosurgical procedure or recent major hemorrhage (hemorrhage resulting in a drop of hemoglobin of at least 2 grams per dl or hemorrhage into a closed space) or thrombocytopenia with a platelet count of less than 50,000 per  $\mu$ l. Relative contraindications include a recent general surgical procedure and a history of gastrointestinal bleeding. In cases with only relative contraindications, factors including stability of a patient's condition must be considered before such a major procedure is undertaken. By limiting the use of vena caval fenestration to the restricted situations described above, the possible benefits of this procedure could be increased.

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